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ABSTRACT

A study examined the effect of participation in a tech prep program, specifically an applied communications course, on the problem-solving self-appraisal and critical thinking skills of secondary students. It also explored effects of a traditional English course and an honors English course on these factors. A pretest-posttest nonequivalent control group design was used. The Problem Solving Inventory Form B (Heppner 1988) measured the individual's self-appraisal of problem-solving self-efficacy; the Watson-Glaser Critical Thinking Appraisal Form B (Watson and Glaser 1980) measured critical thinking abilities. The sample consisted of students enrolled in four sections of three English courses: applied communications, traditional English, and honors English. Complete data were obtained from 140 students. The Statistical Analysis System was used to calculate a multivariate analysis of variance with the general linear model adaptation for a two-factor repeated measures experiment or a Pearson Product-Moment correlation, as appropriate. Findings indicated the following: a statistically significant difference in mean total scores on both tests by type of English course; no statistically significant difference in mean total scores by time of test administration; and a correlation for posttest scores significantly different than zero. Critical thinking abilities of students who completed the applied communications course did not significantly improve and their perceptions of their problem-solving skills did not become more positive. (Contains 16 references.) (YLB)

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# The Use of Applied Communications in Developing Critical Thinking Skills of Tech Prep Students

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## Introduction and Theoretical Base

Employers and educators are generally in agreement that students need to increase their problem solving and critical thinking skills. Numerous national reports have pointed out that students are deficient in this area. The Tech Prep initiative has tended to focus on activities designed to better prepare students for the world of work (Custer, Ruhland, & Stewart, 1997).

Various approaches have been proposed for improving the problem solving and critical thinking skills of students. Three approaches found in the literature were the general, infusion, and immersion methods which Sormunen (1992) discussed. The general method of teaching critical thinking is by a separate course outside of any content area. The infusion method consists of teaching general principles of reasoning within the context of subject matter. The immersion method focuses on the knowledge content without pointing out general critical thinking principles.

The theoretical base of this study was formed from cognitive and behavioral learning theories and theories of self-efficacy as applied to problem solving and critical thinking. These learning theories can be categorized as theories that fall within two broad areas. The first area deals with the nature of problem solving and critical thinking. The second with whether problem solving and critical thinking can be taught, and how to teach it if it can be taught.

The ability to think critically and to solve problems has been a concern of philosophers, educators, and psychologists for many centuries. Sternberg (1986) stated that Plato and Aristotle founded the critical thinking movement. These philosophers were concerned with the first area of theory. Sternberg attributes the modern-day movement to John Dewey. Dewey (1933) was concerned with the nature and value of thinking. He considered thinking to be the process by which individuals find meaning in the world in which they live. The ability to think critically is a prerequisite for problem solving and as such is of significant value. Dewey believed that the ability to think critically, or reflectively, was a function of one's experience as well as one's intellect.

The basis for the second area of learning theory, that which deals with methods for developing cognitive abilities, can be traced to Bloom (1956). Bloom developed a taxonomy of cognitive levels of learning. Each level requires a different mental activity or way of thinking. Lower levels of learning are a prerequisite for higher levels, where higher levels are often referred to as requiring higher-order thinking skills. Problem solving requires higher-order thinking, which according to Bloom can be taught.

A number of authors have proposed methods for teaching thinking and problem solving. For example, Bruner, Goodnow, & Austin, (1956), Gallagher (1993), Halpern



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(1984), and Ruggiero (1988) have described various aspects of thinking, learning, and problem solving and methods for developing problem solving skills. The methods they proposed are based upon both cognitive and behavioral learning theories.

The basis for theories of self-efficacy can be attributed to Bandura (Greenberg and Baron, 1993). They discussed the development of self-efficacy. The theory is that self-efficacy develops "partly through direct experiences, in which individuals perform various tasks and receive feedback on their success, and partly through vicarious experiences, in which they observe others performing various tasks and attaining varying levels of success at them" (p. 208). They further stated that, regardless of how it develops, "the stronger individuals' beliefs that they can perform successfully, the higher their performance actually tends to be" (p. 208).

Problem solving is one of the foundation skills needed for high-skill, high-wage employment (United States Department of Labor, 1992; Daggett, 1992). Life in technologically oriented countries, such as the United States, is characterized by rapid change. This rapid change complicates life and makes it necessary for students to learn how to be effective problem solvers. It is particularly desirable that students learn to be effective problem solvers in the context of actual production in work situations. In order to keep up with international competition and the faster pace of technological change, employers in the United States are demanding that the public schools be responsible for developing the critical thinking and problem solving skills of students. In response to this demand, goals have been defined at both the national and state level for developing students' problem solving skills.

The fifth objective of National Education Goal 6 calls for increasing the proportion of college graduates who demonstrate the ability to think critically and solve problems. Specifically, the objective is that: "The proportion of college graduates who demonstrate an advanced ability to think critically, communicate effectively, and solve problems will increase substantially" (National Education Goals Panel, 1994, p. 10).

This study investigated the extent to which the development of problem solving self-efficacy and critical thinking skills, based upon learning theory and theory explaining the development of self-efficacy, were accomplished in a Tech Prep applied communications course.

## Purpose

The primary purpose of this study was to examine the effect of participation in a Tech Prep program and specifically an applied communications course on the problem solving self-appraisal and selected aspects of critical thinking skills of secondary students. A secondary purpose was to examine the effects of a traditional English course and an honors English course on these factors. The study was conducted to answer the following questions:

1. Is there a significant difference in the mean total scores from a self-appraisal of problem solving abilities and from a measurement of critical thinking skills among students completing an applied communications course, a traditional English course, or an honors English course?

2. Is there a significant difference in students' self-appraisal of their problem solving abilities and in selected aspects of students' critical thinking skills when measured near the beginning and near the end of an applied communications course, a traditional English course, or an honors English course?
3. Is there a significant relationship between the students' self-appraisal of their problem solving abilities and their critical thinking skills for students completing an applied communications course, a traditional English course, or an honors English course?

## Methods

A pretest-posttest nonequivalent control group design was used for the study. Demographic information and two instruments were used to collect data.

The instrument used to measure the individual's self appraisal of their problem solving self-efficacy for this study was the Problem Solving Inventory (PSI) Form B (Heppner, 1988). The PSI contains 35 items and uses a 1 to 6 Likert-type scale with 1 representing strong agreement and 6 strong disagreement with the statement. Reliability for the PSI was reported to be $\underline{r}$ =.89 for test-retest reliability and $\underline{r}$ =.90 for internal consistency. The instrument used to measure selected aspects of the students' critical thinking abilities was the Watson-Glaser Critical Thinking Appraisal (WGCTA) Form B (Watson and Glaser, 1980). The instrument consists of 80 items divided into five subscales of 16 items each and includes exercises which are purported to be examples of problems, statements, and interpretations of data which are regularly encountered at work or school. The split-half reliability estimates for eleventh grade students was reported to be $\underline{r}$ =.79. The maximum raw score for the WGCTA is 80.

The purposive sample consisted of the students enrolled in four sections of each of three different English courses. The three courses were comprised of an applied communications course, a traditional English course, and an honors English course. Where there were more than four sections of a course, the sections for this study were randomly selected. The total number of students enrolled in the 12 sections included in this study was 254 at the time of the pretest, increasing to 279 by the time of the posttest. Complete data, which consisted of pretest and posttest measurements for both the PSI and WGCTA, were obtained from 136 students. These 136 students included 53 Honors English III students, 43 English III students, and 40 applied communications students. All of these students were in the 11th grade, with the exception of one 10th grade student who was assigned to English III, and three 12th grade students who were assigned to applied communications.

The Statistical Analysis System (SAS) was used to calculate a MANOVA (multivariate analysis of variance ) with the general linear model adaptation for a two factor repeated measures experiment or a Pearson Product-Moment correlation, as appropriate. The null hypotheses were rejected if the $\underline{F}$ value was significant at equal to or less than the .05 alpha level.

## Findings and Conclusions

The mean pretest and posttest scores (Table 1) on the PSI for the Honors English students were 83.7 and 79.0; for the English III students were 92.4 and 90.8; and for the

applied communications students were 93.2 and 95.7. The mean pretest and posttest scores on the WGCTA for the Honors English students were 57.5 and 59.1; for the English III students were 48.5 and 45.6; and for the applied communication students were 43.1 and 42.6.

**Table 1**
Mean Pretest and Posttest Scores for the PSI and WGCTA

| Variable | M | n | SD | Variance | SE |
|---|---|---|---|---|---|
| Course 1-Honors English III | | | | | |
| Pretest PSI | 83.736 | 53 | 17.811 | 317.237 | 2.447 |
| Posttest PSI | 79.000 | 53 | 19.104 | 364.962 | 2.624 |
| Pretest WGCTA | 57.453 | 53 | 6.256 | 39.137 | .859 |
| Posttest WGCTA | 59.151 | 53 | 7.140 | 50.977 | .981 |
| Course 2-English III | | | | | |
| Pretest PSI | 92.419 | 43 | 14.945 | 223.344 | 2.279 |
| Posttest PSI | 90.791 | 43 | 18.809 | 353.788 | 2.868 |
| Pretest WGCTA | 48.488 | 43 | 7.830 | 61.303 | 1.194 |
| Posttest WGCTA | 45.628 | 43 | 8.449 | 71.382 | 1.288 |
| Course 3-English III C | | | | | |
| Pretest PSI | 93.225 | 40 | 19.453 | 378.435 | 3.076 |
| Posttest PSI | 95.725 | 40 | 21.664 | 469.333 | 3.425 |
| Pretest WGCTA | 43.100 | 40 | 7.063 | 49.887 | 1.117 |
| Posttest WGCTA | 42.575 | 40 | 6.898 | 47.584 | 1.091 |

The first hypothesis, HO1, stated there is no statistically significant difference in the mean total scores from the PSI and WGCTA by type of English course assignment. HO1 was rejected at the .05 level of significance. As reported in Tables 2 and 3, there was a significant difference in mean total scores of students by English course assignment. Students assigned to the honors English III course had mean total scores which were significantly more positive than the mean total scores of students assigned to English III. The mean total scores of English III students were, in turn, significantly more positive than the mean total score of applied communication students.

**Table 2**
Pillai's Trace Test for Multivariate Analysis

| Value | Source | F | NDF | DDF | PR>F |
|---|---|---|---|---|---|
| Course | .78878902 | 43.3075 | 4 | 266 | .0001* |
| Time | .01707687 | 1.1467 | 2 | 132 | .3208 |
| Interaction | .09904930 | 3.4650 | 4 | 266 | .0088* |

* Significant

**Table 3**
ANOVA for PSI and WGCTA

| PSI | DF | SS | MS | F | PR>F |
|---|---|---|---|---|---|
| Course | 2 | 9076.396 | 4538.198 | 7.82 | .0006* |
| Error | 133 | 77163.659 | 580.177 | | |
| Time | 1 | 111.202 | 111.202 | .95 | .3322 |
| Interaction | 2 | 596.763 | 298.381 | 2.54 | .0825 |
| Error | 133 | 15613.174 | 117.392 | | |
| R-square=.847 | | | | | |
| **WGCTA** | **DF** | **SS** | **MS** | **F** | **PR>F** |
| Course | 2 | 12143.342 | 6071.671 | 75.67 | .0001* |
| Error | 133 | 10671.936 | 80.240 | | |
| Time | 1 | 21.208 | 21.208 | .83 | .3632 |
| Interaction | 2 | 247.125 | 123.562 | 4.85 | .0093* |
| Error | 133 | 3388.153 | 25.474 | | |
| R-square=.871 | | | | | |

* Significant

The second null hypothesis, HO2, stated there is no statistically significant difference in the mean total scores from the PSI and WGCTA by time of administration of the test instruments. HO2 was not rejected at the .05 level of significance. As reported in Table 2, there was no significant difference between the pretest and posttest mean total scores from the PSI and WGCTA, for any class of students.

In addition, results were examined to check for interactions. An analysis of variance procedure revealed that there was a significant interaction between the mean WGCTA scores by the type of English course assignment and time. A post hoc test (Table 4) was used to isolate source of the differences between the interaction of course and time. It was ascertained that the mean pretest and posttest WGCTA test scores of honors English III students were significantly higher than the mean pretest and posttest WGCTA scores of English III and applied communications students. Also, English III student's pretest and posttest scores were significantly higher than the pretest and posttest scores of applied communications students.

**Table 4**

Least Square Mean, Least Square Standard Error and Least Significant Difference Test for Dependent Variables PSI and WGCTA by Course

| Course | n | M | SE | | LSD Test 2 | LSD Test 3 |
|---|---|---|---|---|---|---|
| Dependent Variable=PSI | | | | | | |
| Honors English III | 106 | 81.367 | 1.052 | 1 | .0001* | .0001* |
| English III | 86 | 91.604 | 1.168 | 2 | | .0904 |
| English IIIC | 80 | 94.475 | 1.211 | 3 | | |
| Dependent Variable=WGCTA | | | | | | |
| Honors English III | 106 | 58.301 | .490 | 1 | .0001* | .0001* |
| English III | 86 | 47.058 | .544 | 2 | | .0001* |
| English IIIC | 80 | 42.837 | .564 | 3 | | |

* Significant

The third null hypothesis, HO3, stated the correlation between the student's scores from the PSI and from the WGCTA is not statistically different from zero. HO3 was tested using the Pearson Product-Moment calculation. It was ascertained that the correlation of .41 for the students' posttest scores from the PSI and WGCTA was significantly different than zero. Therefore, null hypothesis HO3 was rejected.

The results of this study do not support a conclusion that the critical thinking skills of any of the three groups of subjects of this study were significantly changed during the course of the school year. Therefore, it cannot be concluded that the applied communications course significantly changed students' critical thinking skills. On the other hand, it cannot be concluded that the honors English III or the traditional English III courses significantly changed students' critical thinking skills.

## Implications

These results may support a belief that critical thinking skills and problem solving skills cannot be developed in a short period of time. This explanation is consistent with a conclusion reached by Langholz and Smaldino (1989). They pointed out that there is not much evidence to support the conclusion that critical thinking and problem solving can be developed in a short period of time.

There is evidence from the literature that would support the idea that training can develop a more positive self-appraisal of an individual's problem solving abilities. Gallagher (1993) pointed out that the PSI has been used as an outcome measure for problem solving seminars. In a study of an eclectic approach to training paraprofessionals in counseling, Gallagher administered the PSI both pre and posttest and found that the PSI scores of trainees decreased significantly, indicating that the trainees' self-appraisal of their problem solving was more positive after training. However, the self-appraisal of their problem solving abilities by the subjects included in the present study did not significantly change over the time of the study. In addition, no statistically significant evidence was

found indicating that the spread between the self-appraisal of Honors English III students as compared to the self-appraisal of applied communications students increased over time.

Although the change was not statistically significant, the posttest mean PSI scores of Honors English III and English III students were lower than their pretest mean scores. This could indicate that a slightly more positive self-appraisal of their problem solving abilities was developed. By way of contrast, the posttest mean PSI score (95.73) of the applied communications students was higher than their pretest mean score (93.23). A possible explanation for this slightly less positive self-appraisal might be that they developed a more realistic awareness of their problem solving abilities during the applied communications course.

Student's grade point averages and PLAN test scores were also examined to provide additional background information for the study. An examination of the data revealed that both the grade point average (3.5 vs. 2.2) and PLAN test scores (23.1 vs. 14.2) of the honors English students were higher than for applied communication students. Students' scores from the PLAN test, which requires higher order thinking skills, were significantly related to their PSI and WGCTA scores. This indicates that the students assigned to the different courses had different characteristics which likely influenced their performance on the test instruments.

The results of this study indicate that there was no significant improvement in the critical thinking abilities of students who complete the applied communications course. It further indicates that these students' perceptions of their problem solving skills does not become more positive as a result of completing this course.

The Tech Prep curriculum for the applied communications course should incorporate specific objectives for improving the critical thinking skills of students and for developing a more positive perception of their ability to solve unstructured problems of the type encountered at home and at work. To achieve these objectives, instruction specifically designed to develop inductive and deductive reasoning skills and to develop the ability to draw inferences should be incorporated into the Tech Prep applied communications curriculum.

In addition, other activities and courses associated with the Tech Prep initiative should be examined to ascertain to what extent they contribute to the development of critical thinking skills of students. Such information is needed as we face the challenge of better preparing all students to participate in a global and technically oriented work force.

## References


Bloom, B.S., Englehart, M.B., Furst, E.J., Hill, W.H., and Krathwohl, D.R. (1956). *Taxonomy of educational objectives. The classifications of educational goals. Handbook I: Cognitive domain.* New York: McKay.

Bruner, J.S., Goodnow, J.J., and Austin, G.A. (1956). *A study of thinking.* New York: Wiley.

Custer, R.L. (Ed.). (1994). *Missouri technology education performance based education handbook.* Columbia, MO: Instructional Materials Laboratory, University of Missouri.

Daggett, W.R. (1992). *Preparing students for the 1990s and beyond.* Schenectady, NY: International Center for Leadership in Education.

Dewey, J. (1933). *How we think.* New York: Heath and Co.

Gallagher, M.S. (1993). Evaluation of an integrative approach to training paraprofessionals in counseling using an integrative approach. *Counseling Psychology Quarterly, 6*(1), 27-38.

Greenberg, J., and Baron, R.A. (1993). *Behavior in organizations,* (4th ed.). Needham Heights, MA: Simon and Schuster, Inc.

Halpern, D.F. (1984). *Thought and knowledge: An introduction to critical thinking.* Hillsdale, NJ: Erlbaum.

Heppner, P.P. (1988). *The problem solving inventory manual.* Palo Alto, CA: Consulting Psychologists Press.

Langholz, J. and Smaldino, S.E. (1989). *The effectiveness of a CBI program for teaching problem solving skills to middle level students.* A paper presented at the annual meeting of the Association for Educational Communications and Technology, February 1-5, 1989. Dallas, TX. ERIC No. ED308825.

National Education Goals Panel. (1994). *The national education Goals report. Building a nation of learners.* Washington DC: US Government Printing Office.

Ruggiero, V.R. (1988). *Teaching thinking across the curriculum.* New York: Harper & Row.

Sormunen, C.C. (1992). *Critical thinking in business education.* Paper presented at the American Vocational Association Convention, St. Louis, MO. ERIC No. ED354380.

Sternberg, R.J. (1986). *Critical thinking: Its nature, measurement, and improvement.* New Haven, CT: Yale University. ERIC No. ED272882.

United States Department of Labor. The Secretary's Commission on Achieving Necessary Skills (SCANS). (1992). *Learning a living: A blueprint for high performance.* Washington, DC: US Government Printing Office.

Watson, G., and Glaser, E.M. (1980). *Watson-Glaser critical thinking appraisal manual.* New York: Harcourt, Brace, and Jovanovich.